tron Oxford. University of Observatory

Sixty-Second Annual Report of the Visitors of the University Observatory for 1936.

Physical & Applied Sci. Serials

BOARD OF VISITORS, 1937.

THE VICE-CHANCELLOR (A. D. Lindsay, M.A., Master of Balliol).
THE SENIOR PROCTOR (C. H. S. Fifoot, M.A., Hertford).
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THE ASTRONOMER ROYAL (H. Spencer Jones, M.A., D.Sc., F.R.S.).
THE DIRECTOR OF THE CAMBRIDGE OBSERVATORY (Sir A. S. Eddington, Hon. D.Sc., F.R.S.).
THE RADCLIFFE OBSERVER (or a person deputed by the Radcliffe Trustees, R. O. Redman, M.A., D.Phil.).
J. S. E. TOWNSEND, M.A., F.R.S., Fellow of New College. } Until Oct., 1940.
F. A. LINDEMANN, M.A., F.R.S., Fellow of Wadham and Student of Christ Church. }
E. A. MILNE, M.A., F.R.S., Fellow of Wadham. } Until Oct., 1945.
G. M. B. DOBSON, M.A., D.Sc., F.R.S., Lincoln, Reader in Meteorology. }

This report refers to the calendar year 1936.

I. Staff.

The Observatory has suffered serious losses during the year in the death of Dr. J. K. Fotheringham and Mr. F. A. Bellamy. Dr. Fotheringham held the post of assistant in the Observatory from May 1918 until his appointment as Reader in Ancient Astronomy and Chronology in April 1925, and from that time until his death on December 12 acted as Honorary Assistant. Mr. Bellamy, after eleven years' service at the Radcliffe Observatory, was appointed an assistant at the University Observatory in 1892, and continued in active work until his death on February 15. During these 44 years he served several times as Acting Director.

Dr. H. Zanstra of Amsterdam worked at the Observatory during July and August, while Mr. H. Scott Barrett has put in a considerable amount of time in connexion with the Astrographic Catalogue (see later).

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II. Instruction.

The following courses of lectures have been given at the Observatory:

Term.	*Subject.*	*Number attending course.*
By the Professor:		
H. 1936	Stellar Astronomy	4
M. 1936	Solar Physics	4
M. 1936	Practical Astronomy	2
By Dr. Fotheringham:		
H. 1936	Ancient Astronomy	1
T. 1936	Ancient Astronomy	7

In addition Miss M. G. Adam (Lady Margaret Hall) and Mr. T. L. Page (Magdalen) worked during the year for the degree of D.Phil. With the collaboration of Professor Milne a colloquium in Astrophysics was held weekly during the three terms, and met in addition eight times during the Long Vacation. The Observatory was regularly open on Saturday evenings during the Hilary and Michaelmas Terms, and at other times by arrangement; over 100 persons have taken advantage of this opportunity to see through the 12-inch telescope.

III. Equipment and Building.

A new synchronous driving motor was installed on the solar telescope during the year, and with its aid two series of Hartmann tests, using Altair, were made with the five mirrors in train. The zonal aberration is small, giving path differences of less than $\lambda/8$, but apparently there is an astigmatic difference in focus with a path difference of as much as $\lambda/2$. This presumably arises from a lack of flatness of the three plane mirrors in the optical train, and it is hoped that the makers will shortly take these mirrors back for re-examination and possibly refiguring.

Thanks in part to a generous grant of £100 made by Merton College towards the solar spectroscope, and in part to permission by the Chest to use one year's salary of the chief assistant for the same purpose, that is by temporarily not filling the post left vacant by the death of Mr. Bellamy, the temperature control and the breech end of this instrument are now nearing completion. Before actual construction was commenced a number of improvements in design were made, and it is hoped that the instrument in its final form will be in working order by May or June.

The transit room of the Observatory, for several years past primarily a store room, has been cleaned out, the old transit instrument stored, and the room converted into a laboratory suitable for spectroscopic and photometric work. In addition the computing room, hitherto a passage-way, has been converted into two satisfactory offices and a hall. Advantage was taken of these changes to replace the original radiators by modern units. Mention should be made here of the invaluable services of Mr. G. Neale, who undertook the greater part of the very heavy labour of clearing out the old rooms, and who also acted as Clerk of the Works during the building alterations.

IV. Work.

Astrophysics. Work on solar granulation during the year has made probable the existence of an approximately isothermal layer in the solar atmosphere at an optical depth of unity. The existence of this layer can be confirmed or disproved most satisfactorily from accurate measures of the surface brightness of the sun as a function of wave-length and position on the disk; such measures will also permit a determination of the variation of the continuous absorption coefficient with wave-length and depth. The necessary observations for this surface brightness determination having been made in previous years, work during this year was directed towards measuring the transmissions of the various screens and wedges used in equalizing the flux from the sun and the standard lamps. It is hoped that this investigation, which has occupied a good deal of time in the past four years, will be completed within the next twelve months.

Having completed his study of the continuous spectra of planetary nebulae, Mr. Page has been able to show that the line intensities observed by him in these nebulae lead to abnormal abundances of argon and neon (10^3 and 10^6 times respectively as great relative to oxygen as on the earth). He has also made some progress in studying the spatial distribution of the carriers of H and He^+, as well as of the continuous spectrum, about the central star of N.G.C. 7662. His principal work has been concerned, however, with an attempt to determine the energy distribution in the recombination continuous spectra emitted by the alkali elements. This work, which is being aided by a small subsidy from the Government Grant Committee of the Royal Society, will test the applicability of the Kramers-Gaunt absorption law to these elements; in spite of the usual initial difficulties some progress has been made.

Miss Adam has practically completed her spectro-photometric study of the solar Swan bands at $\lambda 5160$, and an account of this work will shortly be communicated to the Royal Astronomical Society. She has measured the equivalent widths of some 120 lines of Rowland intensity less than zero both at centre of the disk and the limb, has carefully identified those which arise from unblended carbon lines of known rotational quantum number, and from their intensities has found the pressure and temperature at the centre and limb. A comparison is now being made of the pressure distribution with height found by her, and that predicted by Wildt for an atmosphere in radiative equilibrium.

Dr. Zanstra worked during the summer on the effect of Lyman alpha radiation pressure on a diffuse nebula so thick as to be opaque to the incident stellar radiation. He was able to show on the basis of his earlier work (Comm. U.O.O., No. 2) that the nebular atoms would stream towards the star with a velocity distribution such that a symmetrical emission line would be observed—in good agreement, that is, with the observations of Baade, Goos, and others. In addition Dr. Zanstra examined Page's hypothesis that the visual continuous spectrum observed in planetary nebulae is due to scattering, and concluded from the radial velocity observations of Campbell and Moore that, if the planetaries are expanding, one of the predicted consequences of scattering is absent.

Astrographic Catalogue. The death of Mr. Bellamy, in the midst of his work on the two Potsdam zones, created a serious situation which has only been met through the generosity of the Radcliffe Trustees and the Astronomer Royal. As a consequence of that generosity the Observatory has had the part-time services of Mr. Barrett throughout the year, and under his supervision, as inspection of the following table in part reveals, good progress has been made towards the completion of the two zones.

Plates.	*Taken.*		*Measured.*	
	+32°	+33°	+32°	+33°
Before 1932 . .	61	1	24	0
In 1932 . .	14	3	34	0
In 1933 . .	26	34	32	11
In 1934 . .	79	124	48	57
In 1935 . .	10	15	16	21
In 1936 . .	10	39	12	32

Of the 49 plates secured this year, 17 were taken by Mr. Bellamy at Oxford, and 32 by Mr. Barrett with the Greenwich Astrographic Telescope. The observation is now complete, Mr. Barrett having assured himself by an inspection of the 416 plates taken that there exists for each of the 160 plate centres in each zone at least one plate of good quality containing a sufficient number of stars. Plate measurement has been continued through the year by Mr. Cook and Mr. Burnet, the latter being engaged in this work through the generosity of Dr. Wilfred Hall. There is a systematic difference between these two measurers in their estimation of image diameters, and preliminary steps have already been taken to reduce Burnet's estimates to the same scale as Cook's. There now remain for measurement only 5 plates in zone +32°, and 35 in zone +33°, and these, it may reasonably be expected, will be completed during the coming year.

An inspection of presumably completed measures and reductions having revealed a number of discrepancies, Mr. Barrett has revised each measure with the plate again under the measuring micrometer. This tedious but very necessary revision is complete for all the available plates in zone +32°, and as far as 17 hours in zone +33°. As a check on the progress of this work Mr. Barrett has also completed the copy for press as far as 13 hours. The plate constants, which will be recalculated from the beginning, will be commenced as soon as the plate revision is finished.

In brief the present state of affairs is that the observation of the two zones is complete, the measurement 87 per cent. complete, the revision over 80 per cent. complete, and the copy for press over 50 per cent. complete, while the plate constants are about to be recalculated.

Seismology. At the triennial meeting of the Geodetic and Geophysical Union held in Edinburgh in September, the Seismological Association resolved that one-half of the income received by it in any one year, and in no case a sum less than 37,500 French francs, should be given in support of the work of the International Seismological Summary carried on at the Observatory. The immediate result of this resolution has been that for the first time in some years the Summary is not at the moment financially embarrassed.

Work in preparation of the Summary has gone forward steadily during the year. The second and third quarters for 1931 have been printed and distributed, while the final quarter for that year is now going through the press. In addition the first quarter for 1932 is ready for the press. The work is therefore just holding its own, and if the income from the Union is maintained at anything like its present rate it may prove possible to catch up some of the arrears by the employment of additional computational assistance. If, however, the Summary is to be reasonably complete the time lag in its appearance can never be reduced to less than three years, since it takes at least this long to get in 60 per cent. of the station readings.

In addition to her other work on the Summary Miss Bellamy has found time to prepare a valuable geographical index to the earthquakes recorded between 1913 and 1930.

V. Publications.

The following papers have been published during the year as a result of work done at the Observatory:

E. F. Bellamy. *Index Catalogue of Epicentres 1913–30* (County Press, 1936).

J. S. Hughes and E. F. Bellamy. *The International Seismological Summary*, Parts 2 and 3, 1931 (County Press, 1936).

T. L. Page. 'The Continuous Spectra of Certain Planetary Nebulae', *Monthly Notices*, R.A.S., vol. 96, p. 604.

T. L. Page. 'Chemical Composition of Planetary Nebulae', *Nature*, vol. 138, p. 503.

H. H. Plaskett. 'Solar Granulation', *Monthly Notices*, R.A.S., vol. 96, p. 402.

H. Zanstra. 'Radiation Pressure in Diffuse Nebulae', *Monthly Notices*, R.A.S., vol. 97 (November).

H. Zanstra. 'Argument against Scattering in Planetary Nebulae', *The Observatory*, vol. 59, p. 314.

The third, fifth, and sixth of the papers appearing in this list are reprinted as Communications from the University Observatory, Nos. 6, 7, and 8.

VI. Miscellaneous.

Dr. Theodore Dunham, Jr., of the Mt. Wilson Observatory spent a week at the Observatory in September, while Dr. Edwin Hubble of the same institution used an office in the Observatory during his period as Rhodes Memorial Lecturer in the Michaelmas Term. In addition the following astronomers paid brief visits to the Observatory: MM. Barbier, Chalonge, Lyot, and Mohr.

During the course of the alterations mentioned in Section III a number of old astronomical instruments and other materials of historical interest were discovered. To the Museum of the History of Science were presented an Elizabethan astrolabe, Pritchard's photometric wedges and some miscellaneous apparatus; to the Royal Astronomical Society a number of the original lunar photographs taken by De La Rue and Pritchard between 1863 and 1888; and to Mrs. Turner some of the lecture apparatus so effectively used by Professor Turner.

H. H. PLASKETT.

UNIVERSITY OBSERVATORY,
OXFORD.
January 6, 1937.

UNIVERSITY PRESS, OXFORD